DCGS-A V3 — An Innovative Approach to Design and Development Between Government and Industry

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The Army has developed an array of intelligence Programs of Record (PORs) possessing exceptional capabilities. A common element shared with all intelligence systems are their unique ground processing facilities. However, the ability to share data or cross-correlate information between intelligence systems in near real-time is extremely difficult and rarely occurs in operational environments. The Joint Intelligence Operations Capability-Iraq (JIOC-I) is an Army G-2/U.S. Army Intelligence and Security Command (INSCOM) initiative that recently transitioned to Project Manager Distributed Common Ground Systems-Army (PM DCGS-A). This effort merges various intelligence products into a unified operational view providing the Soldier with a more accurate representation of situations and events while following the Army DCGS-A program's system architectural goals.

In December 2005, the Army G-2 and INSCOM fielded a Quick-Reaction Capability (QRC) called JIOC-I. Deployed on a flat network, JIOC-I provided Soldiers with a means of obtaining intelligence data seamlessly across multiple echelons, right down to the individual warfighter. The JIOC-I system's primary strengths are its ability to ingest databases and sensor information from as many sources as possible, and then connect this information to the an alysts and operators hosted on the network. JIOC-I also provides the Soldier access to an array of analytical tools necessary to support counter-terrorist and counterinsurgency operations. In June 2006, JIOC-I mission management was transitioned to PM DCGS-A. Formally named DCGS-A Version 3 (V3), the effort merged the DCGS-A Spiral 4 program using the JIOC-I as the systems baseline.

Intelligence and Information Warfare Directorate (I2WD)

The U.S. Army Research, Development and Engineering Command (RDECOM) I2WD has provided technical and engineering support on the Common Ground Station (CGS) program for the past several years and currently supports the PM on the DCGS-A mission. PM DCGS-A turned to I2WD and its unique capability with intelligence systems product development, which included knowledge of existing POR systems, and its core infrastructure and on-site facilities. The I2WD, located at Fort Monmouth, NJ, has recognized the need for net-centric integration experience and advanced technology insertion in support of the Army's next generation intelligence gathering systems. PM DCGS-A initiated the development of a Systems Integration Laboratory (SIL) hosted at I2WD. The SIL is an outgrowth of work performed on the CGS program, internal technology-based (tech-based) initiatives in information fusion and various other intelligence products and exploitation tools. Moreover, the I2WD SIL has provided technical support on legacy systems such as CGS, Guardrail Common Sensor, All Source Analysis System (ASAS) and other POR systems projected for migration to the future DCGS-A.

The SIL is an outgrowth of work performed on the CGS program, internal tech-based initiatives in information fusion and various other intelligence products and exploitation tools.

As currently established, the SIL is a government-managed venue possessing state-of-the-art infrastructure with the capability to host and support the development, integration and testing of DCGS-A products and services. Further, the SIL provides an operational, modeling and simulation environment for user communities to host their products for demonstration. In addition, the SIL offers an independent environment permitting users the ability to "bench test" or validate through interaction in a realistic synthetic environment and permit system configuration management before production and fielding.

SPC Aaron Lawrence, 1st Battalion, 13th Armor Regiment, 3rd Brigade, 1st Armored Division, maintains radio contact with local units following an improvised explosive device detonation near Tarmiya, Iraq. Better ISR products and analyses will help U.S. troops pinpoint insurgents more quickly before triggermen can rein destruction on innocent Iraqi citizens. (USAF photo by TSGT Russell E. Cooley IV.)

The DCGS-A SIL is providing next generation net-centric integration capability and advanced technology insertion for today's and tomorrow's intelligence gathering systems to enhance Soldier battlefield situational understanding. (Photo courtesy of DCGS-A SIL.)

Current federation connectivity exists between the SIL and other major program participants. These participants include operational activities such as INSCOM's Information Dominance Center, the Army DCGS Fixed Sites and Joint Improvised Explosive Device Defeat Organization; research and development SILs including the U.S. Air Force (USAF) Defense Ground System-Experimental (DGS-X); DCGS-Navy; Future Combat Systems (FCS) Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Laboratory; U.S. Army Communications-Electronics Life Cycle Management Command; and industry contractor facilities. Using a federated SIL approach has allowed independent development of system products at dispersed contractor and government sites, has enabled initial ad-hoc system testing through simulation and has provided immediate feedback on system design and functionality to system developers.

In responding to the Army's Current and Future Force warfighting requirements, with respect to the DCGS-A system architecture JIOC-I QRC objectives, decision makers identified significant project initiatives and goals. A primary target goal is the development of V3 to provide a common framework, leveraging the strengths of JIOC-I and incorporating them into a DCGS-A enterprise. In conjunction with this goal, the DCGS-A V3 initiative would design and fabricate for the operator/analyst a Multi-Function Work Station (MFWS) having 4-D visualization, mapping services and an analyst tool suite supporting data mining, correlation, link analysis and interoperability with the existing Army Battle Command System (ABCS). The initial capability is scheduled for delivery to the Central Technical Support Facility (CTSF) at Fort Hood, TX, for testing and accreditation. Finally, the DCGS-A V3 build must possess the design flexibility to support migration of functionality and capabilities from existing POR intelligence systems.

System/Functionality	Responsible Proponent
ABCS Interoperability Services	Overwatch Systems
DIB	Raytheon Corp.
Work Suite Software Enhancements	Science Applications International Corp. (SAIC)
Map Visualization Services	TEC/Northrop Grumman Corp. (NGC)
MFWS	I2WD
Software Integration	I2WD/AII
Testing and Fielding	PM DCGS-A/NGC/SAIC

Figure 1. DCGS-A V3 Primary Systems' Functions and Proponents

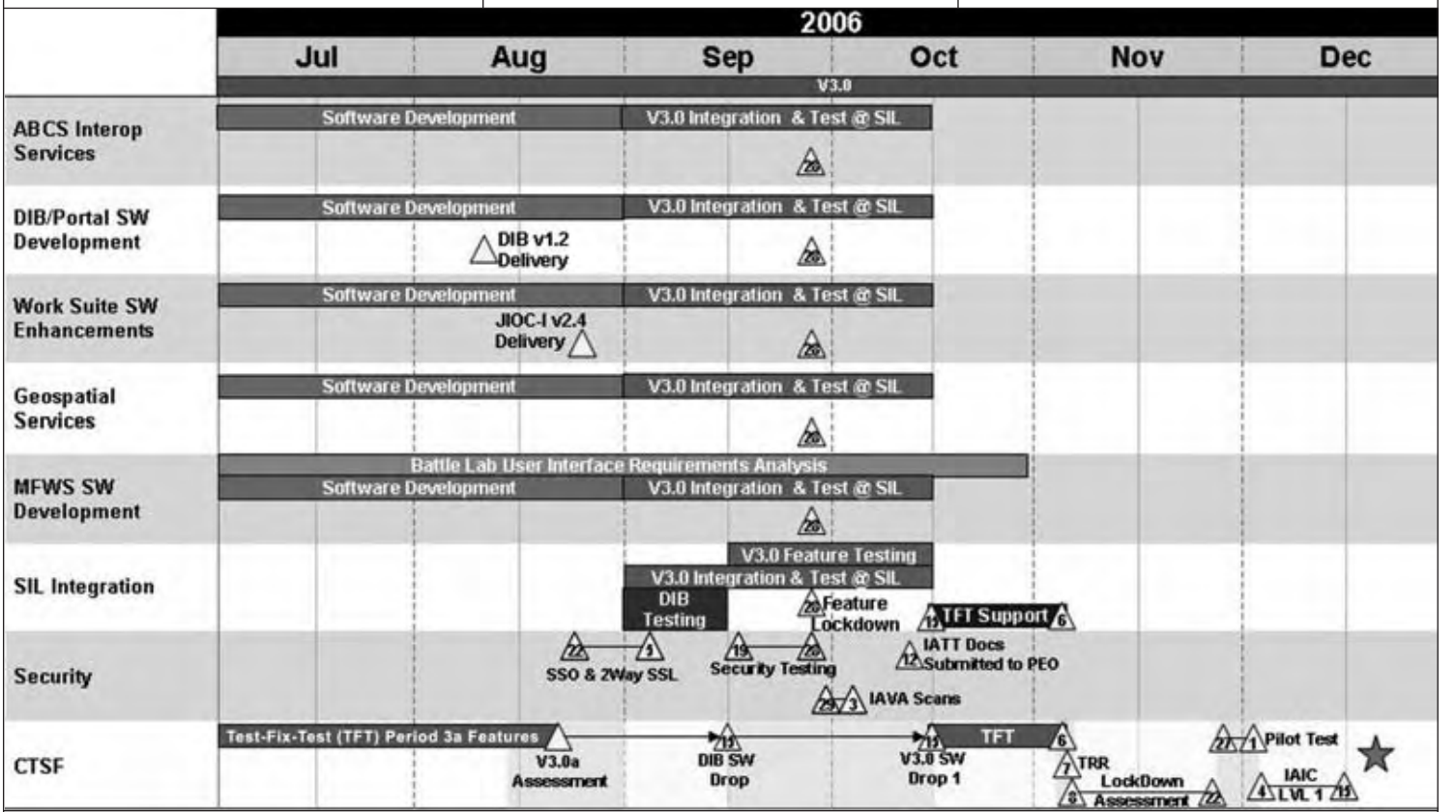
Acquisition and Development Model

The design, development and fielding of the DCGS-A V3 capability has followed a nontraditional approach by

having the I2WD laboratory facility perform the integration and predeployment testing of a fielded operational system. Designated as the product development lead, I2WD worked side-by-side with industry contractors and other government agencies in this unique combination of expertise toward a common goal of fielding the V3 system on a very short schedule. As the lead, I2WD carried out all Preliminary Design Review and Critical Design Review functions normally performed by an industry Lead Systems Integration contractor. Figure 1 on Page 28 lists the major team members and their associated system functional area. By using the federated SIL approach already described, concurrent design and development for the major system elements enabled the aggressive schedule required to meet PM DCGS-A program requirements. In addition, by designating a government entity as the lead, the PM and other government managers had unrestricted instantaneous access to the development process.

As illustrated in Figure 2, the planned government/industry integration and test schedule for the DCGS-A V3 systems and capabilities was conducted at the I2WD SIL facility September through October 2006 with a scheduled deployment soon thereafter. The schedule clearly shows the short development cycle driven by the effort. As seen in the schedule, the development team performed extensive systems and integration testing compared to the time spent on development, consequently helping to mitigate potential integration difficulties. For the DCGS-A V3 development and fielding, I2WD and PM DCGS-A decided on an incremental approach by phasing in new capabilities over time, thereby ensuring an achievable fielding schedule. The ability to incorporate the entire functionality in an initial build as required by the U.S. Army Training and Doctrine Command (TRADOC) Capabilities Manager (TCM) was clearly unfeasible in the target time frame because of the vast list of capabilities required and their complexity to implement. Therefore, the TCM prioritized functional capabilities into major capability areas and the development team worked toward scheduled incremental releases.

The highest priorities concerned were access to data by all echelons from battalion to theater, the use of an enterprise data management architecture and the provision of ISR data reach operations. In addition to the data interoperability requirements, enhanced



Key:

DIB	– DCGS Integration Backbone	SSL	– Secure Socket Layer	SW	– Software
IATT Docs	– Interim Authority to Test	SSO	– Single Sign-On	TRR	– Technical Readiness Review

Figure 2. DCGS-A V3 Integration and Testing Schedule

Former Secretary of the Army Dr. Francis J. Harvey (left) and Army Chief Information Officer/G-6 LTG Steven W. Boutelle (center) review digital maps and imagery produced for C4ISR systems by the Configuration Management Shop, CTSF, during a visit to Fort Hood. Looking on are LTG Thomas F. Metz (center right), then III Corps and Fort Hood Commanding General, and COL Evin Planto (right), Office of the G-6. (DOD photo by Grazyna Musick.)

functionality would be required to support the user with visualization of geospatial products and contextual data in conjunction with "all source" analysis tools. A benefit of using an incremental approach permits the operators to work with the system capabilities and provide input back to the engineering teams on improvements, enhancements or new functions not previously considered.

Another critical issue in planning the DCGS-A V3 development process concerned using the DCGS Integration Backbone (DIB). As a building block for net-centricity, the DIB provides a means to share information across the intelligence enterprise. Being developed by the USAF, the DIB presented the V3 program with unanticipated challenges as it necessitated a synchronization of releases that required adjustments to the overall V3 software integration schedule. In addition, as with the DIB, the FCS architecture and system applications will also have a direct impact on the DCGS-A system design and implementation. As FCS capabilities — for example Level 1 Fusion and Sensor Management functions — are being leveraged by DCGS-A, these updates will also influence the DCGS-A system's schedule and operational capability. Therefore, having an incremental approach allows the design team to mitigate any unanticipated effects encountered with new DIB releases and FCS functionality on the other system software.

> The DCGS-A V3 build must possess the design flexibility to support migration of functionality and capabilities from existing POR intelligence systems.

Accomplishments

As a precursor to this effort, I2WD achieved a major milestone with DIB integration into an overall DCGS-A architecture. I2WD designed, developed and implemented a Resource Adapter software component between target POR systems and the DIB. This exposed POR intelligence products to the enterprise service. The DCGS-A Spiral 4 demonstration showed that it was possible to transfer data from Army POR systems, such as CGS, ASAS-Light, Integrated Meteorological and Environmental Terrain Systems, and Advanced Field Artillery Targeting Designation System, using the DIB, and that Army POR data could be displayed on the USAF DGS-X Portal. As far as we know, this was the first application of the DIB on a system. Another DCGS-A V3 "alpha" (V3.0a) system build accomplishment was the integration and delivery of four Work Suites to the CTSF in June 2006, and formal training for its staff. This currently places the V3.0a Work Suites under CTSF formal Configuration Management. The delivered systems are designated under an Interim Authority to Test, thereby following a path leading toward final field certification of system hardware and software components.

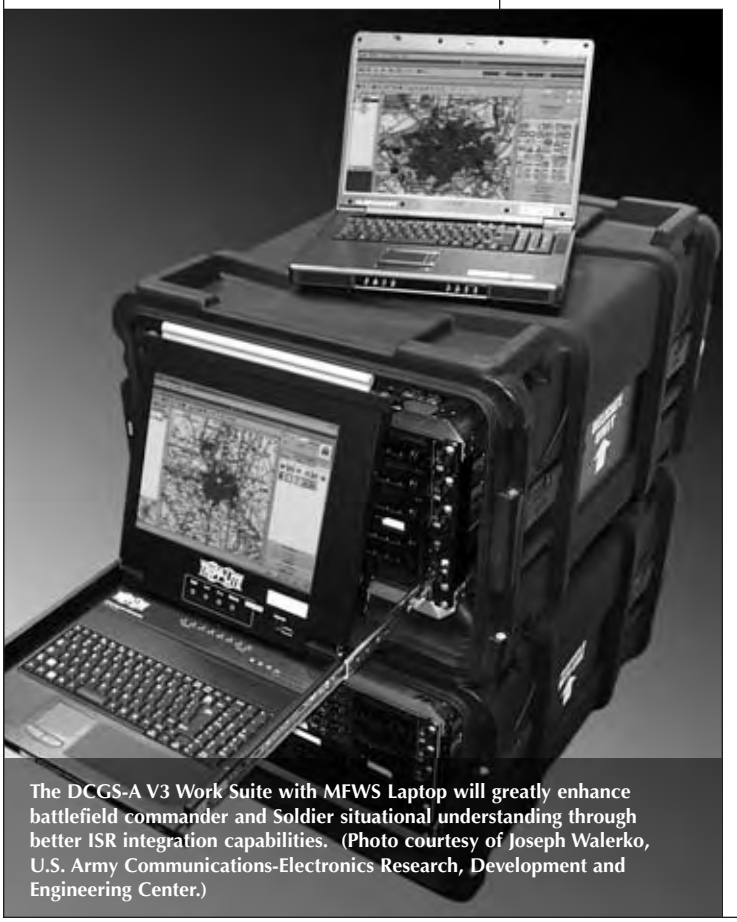
The near-term approach for the DCGS-A V3 project includes obtaining an Interim Authority to Operate by the end of 2007. This will permit formal interoperability testing with the other POR systems and provide a pathway to certify V3 as a fielded capability.

Furthermore, a noteworthy success was the horizontal integration at brigade between ABCS and the JIOC-I system. This now provides operators and commanders with quicker and more reliable access to DCGS-A intelligence information. Nevertheless, the most significant accomplishment and consequence of the effort resides with transitioning V3 to the DCGS-A V4 effort that is currently underway.

> A benefit of using an incremental approach permits the operators to work with the system capabilities and provide input back to the engineering teams on improvements, enhancements or new functions not previously considered.

The Way Ahead

The DCGS-A V3 program has successfully demonstrated that government and industry teams can work in a cooperative environment toward a quick-reaction solution together, while having a government entity lead the effort. This initiative has provided an unprecedented capability and functionality for Soldiers in the field for intelligence gathering and data exploitation. The DCGS-A V3 effort addresses core technology areas by providing a unified display of intelligence products to the operator on the MFWS while using the DIB architecture. For the future, the DCGS-A SIL will continue performing experimental laboratory work on emerging technologies in support of PM DCGS-A. As the feasibility of these technologies matures and attains Technology Readiness Level 6 or beyond, I2WD envisions using the SIL rather than a full production environment for initial integration and testing. This methodology provides the best option for PM DCGS-A to incorporate newer capabilities or technologies while mitigating risk on the future DCGS-A production contract and subsequent product improvements using the I2WD SIL as and adjunct to the future LSI contractor.



The DCGS-A V3 Work Suite with MFWS Laptop will greatly enhance battlefield commander and Soldier situational understanding through better ISR integration capabilities. (Photo courtesy of Joseph Walerko, U.S. Army Communications-Electronics Research, Development and Engineering Center.)

Another goal for the V3 effort is to obtain formal Certification to Operate in the field, leading to classification of the system as a Limited Unit Production (LUT). By attaining the LUT designation, the fielded system will have full field and logistic support and not suffer from identification as a piece of laboratory equipment. In addition, the V3 development team will fulfill capabilities left out of the V3.0 system build, such as full interoperability of ABCS at brigade and other echelons. Other upgrades may include any necessary system enhancements and additional software functionality initiated by users in the field for a V3.01 system build conducted in March 2007. Most importantly, the V3 system potentially moves from an associate to a core battle command membership, providing a path toward the future Armywide DCGS vision.

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